International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Awowole IO et al. Int J Reprod Contracept Obstet Gynecol. 2026 Jun;15(6):xxx-xxx
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20261461

Original Research Article

Impact of intensive antenatal monitoring on perinatal outcomes among women with previous perinatal deaths in Nigeria: a prospective cohort study

Ibraheem O. Awowole[1]*, Henry C. Anyabolu[2], Olumide A. Adeniyi[1], Sekinah B. Bola-Oyebamiji[3], Oluseyi S. Omitinde[4]

[1]Department of Obstetrics and Gynaecology, Obafemi Awolowo University, Nigeria
[2]Department of Paediatrics and Child Health, Obafemi Awolowo University, Nigeria
[3]Department of Obstetrics and Gynaecology, Osun State University, Nigeria
[4]Department of Obstetrics and Gynaecology, Obafemi Awolowo University Teaching Hospitals Complex, Nigeria

Received: 15 April 2026
Revised: 29 April 2026
Accepted: 30 April 2026

***Correspondence:**
Dr. Ibraheem O. Awowole,
E-mail: ibraheemawowole@gmail.com

ABSTRACT

Background: Stillbirth and perinatal mortality remain major public health challenges in low- and middle-income countries, particularly in Nigeria, where rates remain among the highest globally. Women with previous perinatal deaths are at significantly increased risk of recurrence. This study evaluated the impact of an intensive antenatal monitoring protocol on pregnancy outcomes among such high-risk women in Ile-Ife, Nigeria.
Methods: This prospective cohort study was conducted at the Fetal Medicine Unit of Obafemi Awolowo University Teaching Hospitals Complex between January 2021 and December 2024. Eighty-one pregnant women with a history of one or more perinatal deaths were recruited. In addition to routine antenatal care, participants received structured monitoring including early risk stratification, low-dose aspirin where indicated, fetal anomaly scanning, uterine artery Doppler, and serial fetal growth and umbilical artery Doppler assessments. Primary outcomes were stillbirth, early neonatal death, and perinatal mortality rates. Secondary outcomes included preterm birth, mode of delivery, and detection of fetal growth restriction (FGR).
Results: A total of 84 neonates were delivered. The perinatal mortality rate was 59.5 per 1,000 total births, lower than national estimates. Five perinatal deaths (5.9%) were recorded, comprising four stillbirths and one early neonatal death. Preterm birth occurred in 59.5% of cases, with most being provider-initiated due to hypertensive disorders and FGR. FGR was detected in 4.9% of pregnancies. Caesarean section rate was 69.1%.
Conclusions: Intensive antenatal monitoring among women with previous perinatal deaths was associated with improved perinatal outcomes compared to national averages. Scaling up structured surveillance strategies may contribute significantly to reducing perinatal mortality in high-risk populations in resource-limited settings.

Keywords: Antenatal monitoring, Fetal growth restriction, Stillbirth, Perinatal mortality, Fetal Doppler

INTRODUCTION

Stillbirth is an obstetric catastrophe that combines both birth and death in a single event. Despite the profound public health and psychosocial significance of stillbirths, recent estimates revealed that at least 1.9 million stillbirths were recorded in 2023 alone, corresponding to a stillbirth rate of 14.3/1000 total births globally.[1] Disaggregation of the global figure however reveals a magnitude of health inequity that can only be matched by a few diseases, as low- and middle-income countries bear a disproportionately high burden of global stillbirths. About

80% of global stillbirths are reported in sub-Saharan Africa and South Asia, with the former alone reportedly responsible for 50% of the global burden.[2] This translates to a bothersome stillbirth rate in excess of 20 per 1000 total births in Sub-Saharan Africa, whereas high income countries in Western Europe have achieved stillbirth rates as low as 2-3 per 1,000 births for decades. This health inequity depicts the disparity in access to health care in LMICs, as well as the quality of care for pregnant women, including antenatal care services, effective fetal surveillance, and timely obstetric interventions when indicated.[3]

Nigeria is a major contributor to the global burden of stillbirth and perinatal mortality, thereby ranking amongst the countries with the highest absolute number of stillbirths worldwide. While the Nigeria Demography and Health Survey (NDHS) demonstrated a modest improvement in access to antenatal care and skilled attendance at delivery to 63% and 46% respectively in 2024, significant gaps still exist in the quality of care that is available to pregnant women in the country.[4] These deficiencies in access to, and quality of care, contribute to the bothersome perinatal mortality rates in Nigeria, estimated to be between 64-74 per 1000 total births.[5]

Stillbirth is a composite measure of antepartum and intrapartum events because of placental insufficiency, maternal systemic illnesses or fetal morbidities. About 40-50% of stillbirths are antepartum, reflecting suboptimal antepartum surveillance.[6] However, intrapartum stillbirths on the other hand reflects a combination of suboptimal antenatal surveillance for potentially detectable abnormalities such as FGR or hypertensive disorders, and poor quality of care during labour.[7] This underscore missed opportunities for prevention through improved antenatal surveillance. What makes these deaths even more tragic is that the majority could have been prevented with high quality monitoring and care antenatally and at birth.[3,8]

Women with previous stillbirths and early neonatal deaths have heightened risks of recurrence that are estimated to be nearly fivefold higher than the general obstetric population.[7] In high-income countries, structured antenatal monitoring comprising clinical and ultrasonographic serial growth monitoring, as well as uterine and umbilical artery Doppler assessments facilitate the early detection placental dysfunction and FGR, thereby contributing to the significant reduction in stillbirths.[9] Conversely, such structured antenatal surveillance systems approaches are inconsistently applied in LMICs due to restricted access to care, injudicious distribution of resources, inadequate number of proficiently trained personnel, and poor quality of diagnostic tools.[8] Given the bothersome burden of stillbirths in Nigeria and the recognized role of antenatal surveillance in mitigating risk, this study aimed to evaluate the impact of an intensive antenatal monitoring protocol on pregnancy outcomes among women with previous perinatal deaths in a tertiary hospital setting.

METHODS

Study setting

This prospective cohort study was conducted at the Fetal Medicine Unit of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Osun State, Nigeria between January 2021 and December 2024. Research approval was obtained form the ethics and research committee of the Obafemi Awolowo University Teaching Hospitals Complex (ERC/2020/07/08).

Participants

Pregnant women with a history of one or more perinatal deaths (stillbirths or neonatal deaths with the first 7 days of birth) were recruited for the study, after due counselling and informed consent.

The baseline characteristics of the women, and relevant information related to the previous stillbirth(s) were captured using a purpose-designed proforma. A complete physical and obstetric examination was performed thereafter. Risk stratification was performed based on the findings of the clinical evaluation, and the customized plan of care was documented based on the findings.

Interventions

The interventions that were rendered, in addition to the routine antenatal care are as follows: Screening for diabetes mellitus among women with previous macrosomia and unexplained stillbirths. Low dose aspiring (150 mg) as a single daily dose was commenced between 12-16 weeks for eligible women based on risk assessment using the RCOG criteria of one high risk-, or 2 moderate risk factors.[10,11] Fetal anatomy scan was performed for all the study participants using the ISUOG 20+2 planes approach.[12] Uterine artery Doppler was performed between 22-24 weeks for all the women. Serial growth scan and umbilical artery Doppler velocimetry was performed four-weekly, from gestational age of 26 weeks.[10,13] At each visit, the women were advised to report bleeding per vaginam, spontaneous rupture of fetal membranes or reduced perception of fetal movements without delay. Delivery was conducted at term, or earlier if indicated, via individualised plan of delivery, depending on the peculiarity of each patient.

Outcome measures

The primary outcome measures in this study are stillbirth rates, early neonatal death rates and perinatal mortality rates. Secondary outcomes include preterm birth rate, mean birth weight, mode of delivery, detection of FGR and maternal complications.

RESULTS

Eighty-one consenting women with previous perinatal deaths were recruited during the study period. Their ages ranged from 23-45 years, with a mean of 32±5.3 years. Their parity ranged between 1 and 8, with a median parity of 2, as presented in Table 1. The mean GA at booking in the index pregnancy was 19.4± 6.4weeks, with seventy-eight of the 81 women carrying singleton pregnancies. There were three twin gestations.

Table 1: Socio-demographic characteristics of study participants (n=81).

Variable	N	Percentage (%)
Age (in years)		
20-29	20	24.7
30-39	51	63.0
≥40	10	12.3
Total	81	100
Parity		
1	26	32.1
2	18	22.2
3	19	23.5
4	13	16.1
≥5	5	6.1
Educational status		
No formal education	2	2.5
Primary	13	16.0
Secondary	49	60.5
Tertiary	17	21.0

The women reported 100 previous PNDs, comprising 95 stillbirths and five early neonatal deaths. Sixty-four (79%), 15 (18.5%) and two women (2.5%) had one, two and three PNDs, respectively. While 57 of the 81 women reported that they received antenatal care in private and tertiary hospitals, only 20 of these women had a facility-based delivery. Out-of-pocket payment for health care services and industrial actions by health care workers were the reasons reported for deliveries outside the health facility in the remaining 37 participants. Majority of the PNDs (95; 95%) were stillbirths. There was no relevant information to determine the cause of the PND among 27 women; they were therefore classified as "unknown". Fourteen other women provided the relevant information, but there was no attributable cause of perinatal death, so this category was labelled as "unexplained". Twenty-two PNDs were due to obstructed labour, as depicted on Table 2.

In the index pregnancy, twelve (14.8%) women were commenced on 150 mg aspirin daily between GA of 12-16 weeks, while seven of the forty women that were screened met the diagnostic criteria and were managed for gestational diabetes mellitus. None of the patients that had antenatal aspirin therapy developed hypertension antenatally. All the study participants had fetal anatomy scan done, and there was none with congenital anomaly. Five women had uterine artery notching, three of whom developed hypertension in the pregnancy. FGR, defined as estimated fetal weight or abdominal circumference <10th centile for gestational age, and elevated umbilical artery Doppler pulsatility index greater than 90th centile, was diagnosed in four (4.9%) women.

Of the 84 babies that were delivered in this study, 50 (59.5%) were delivered preterm, with an overall mean gestational age (GA) at birth of 35.4±4.8 weeks. Thirty-six (72%) of the 50 preterm births were provider-initiated births, due to complications related to hypertension (26/50; 52%) and FGR (10/50;.20%). The remaining 14 women (28%) had spontaneous preterm labour (8; 16%) and prelabour rupture of fetal membranes (6: 12%).

Five PNDs (5.9%) were recorded in this study, associated with abruptio placentae (2), preeclampsia (2) and uterine rupture (1), with a PMR of 59.5/1,000 total births. There were four stillbirths, and one preeclampsia-related early neonatal demise.

Table 2: Details of previous perinatal deaths among study participants (n=81).

Variables	N	Percentage (%)
Number of previous PNDs		
1	64	79.0
2	15	18.5
3	2	2.5
Total	81	100
Types of PND		
Stillbirths	95	95
Early neonatal deaths	5	5
Total	100	100
Causes of previous PND		
Unknown	27	27.0
Obstructed labour	22	22.0
Hypertensive disorders	15	15.0
Unexplained	14	14.0
Prematurity	10	10.0
Antepartum haemorrhage	5	5.0
Diabetes mellitus	5	5.0
Congenital anomalies	2	2.0
Total	100	100.0
Place of delivery of PND		
Home	30	30.0
Unorthodox faith-based center	17	17.0
Traditional birth attendant	14	14.0
Maternity center	11	11.0
Private hospital	6	6.0
Teaching hospital	3	3.0
Total	100	100.0

Table 3: Perinatal outcomes of women with previous PNDs at OAUTHC, Ile-Ife, (n=81).

Variables	N	Percentage (%)
Mode of delivery		
Caesarean section	56	69.1
Vaginal delivery	25	30.9
Total	81	100.0
Perinatal outcomes		
Alive	79	94.0
Stillbirth	4	4.8
Early neonatal death	1	1.2
Total	84	100.0
Gender		
Males	49	58.3
Females	35	41.7
Total	84	100.0
APGAR scores		
<7	12	15.2
≥7	67	84.8
Total	79	100.0
Causes of perinatal deaths		
Abruptio placentae	2	40.0
Severe preeclampsia	2	40.0
Uterine rupture	1	20.0
Total	5	100.0

DISCUSSION

This study assessed the impact of an intensive antenatal surveillance protocol among women with previous perinatal mortalities at the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Southwest Nigeria. The high risk of perinatal deaths nevertheless, the perinatal mortality rate of 59.5/1000 total births recorded in this cohort was lower than the national average reported in the NDHS 2024, and previous regional estimates of 64-74 per 1,000 total births.[4] This suggests the potential, and possibly hitherto underutilised benefits of a structured monitoring strategy for women with high-risk pregnancies in Nigeria. Comparisons with other LMICs reveal similar patterns. Countries such as India and Pakistan continue to report high stillbirth rates, but targeted antenatal interventions, including improved fetal surveillance and prompt management of antenatal complications, have led to measurable reductions.[14] These experiences underscore the potential impact of scaling up similar interventions in Nigeria.

In a previous study by Kuti et al from the same institution in 2017, the researchers noted a high risk of recurrent stillbirths among the study participants.[15] The underlying predictors of stillbirth in the study were the high cost of obstetric care, inadequate antenatal surveillance and late referral to the tertiary centre. Since the study was published in 2017 however, there hasn't been any targeted, structured and individualized plan of care to mitigate the increased risks of perinatal losses amongst this cohort of high-risk women, thereby necessitating the need for this study.

Globally, stillbirth rates have declined more rapidly in high-income countries than in LMICs. Data from WHO and UNICEF indicate that the average stillbirth rate in high-income regions is below 3 per 1,000 births, compared to over 20 per 1,000 in many Sub-Saharan African countries.[6] In Nigeria, persistently high rates of stillbirth and perinatal mortality reflect health system challenges, including limited access to high-quality antenatal care, inadequate fetal surveillance, and delays in emergency obstetric care.[8]

A key finding in this study was the detection of FGR in 4.9% of pregnancies through serial growth scans and Doppler studies. FGR is a known risk factor for stillbirth and adverse neonatal outcomes. Identification of such cases antenatally availed the opportunity for timely intervention, including planned preterm delivery when indicated.[10,13] This aligns with findings from the Cochrane review by Alfirevic et al which demonstrated that Doppler surveillance in high-risk pregnancies reduces perinatal mortality without increasing unnecessary obstetric interventions.[16]

Obstructed labour was a leading cause of previous perinatal mortality among the participants of this study. This finding aligns with the result of the audit of stillbirths by Kuti et al where obstructed labour reportedly accounted for 23% of stillbirths among unbooked patients in the institution.[15] The incidence of obstructed labour is inversely proportional to access to, and the quality of care that is available to pregnant women in the society at any period. The persistence of obstructed labour as a leading cause of stillbirth in the two studies therefore constitutes a public health concern that should be addressed promptly, through policy reforms that guarantee available, accessible and affordable obstetric care.

Hypertensive disorders of pregnancy contributed to obstetric morbidity in this study, accounting for a substantial proportion of provider-initiated preterm deliveries and 40% of the perinatal deaths. This is consistent with global data indicating that hypertensive disorders remain a leading cause of stillbirth and neonatal mortality in LMICs.[6] Early identification of participants at risk of hypertensive disorders, the commencement of aspirin prophylaxis, supported by uterine artery Doppler findings, likely contributed to improved outcomes in this cohort.

The high rate of caesarean delivery (69.1%) observed in this study reflects a proactive approach to obstetric intervention in high-risk pregnancies. While this rate exceeds national averages, it likely contributed to reduced intrapartum stillbirths and improved neonatal survival. Similar trends have been reported in high-income countries where timely operative delivery is utilized to mitigate fetal compromise.

Importantly, while the SDG 3.2 aims to reduce neonatal and childhood deaths globally 2030, stillbirth and perinatal mortality were not specifically targeted in the global strategy, despite their substantial contribution to the overall burden of child mortality.[17] This renders the true extent of the problem hidden, thereby constituting a significant gap in population health globally, that should be given the necessary attention. Moreover, future interventions that may be aimed at sustaining the global strategy should incorporate stillbirth and perinatal indices, to provide a global roadmap towards improving these vital statistics.

Limitations

Despite these encouraging findings in this study, challenges remain. Limited access to Doppler technology, shortage of trained personnel, and late antenatal booking continue to constrain the full potential of such comprehensive plan of care for at-risk patients. Addressing these systemic barriers is critical to external validation of the study findings and achieving further reductions in perinatal mortality. Additionally, the proportion of unexplained stillbirths within any cohort often reflects the capacity for adequate investigation; in this study, a considerable proportion of previous stillbirths were classified as either unknown (27%) or unexplained (10%), suggesting gaps in the quality of care and diagnostic evaluation. This limitation is further exacerbated by the potential for recall bias among participants when reporting the causes of prior stillbirths.

CONCLUSION

This study confirms that the introduction of a structured antenatal plan of care and intensive antenatal monitoring protocol improves the obstetric outcomes amongst women with previous stillbirths and early neonatal deaths in resource-constrained settings like Nigeria. The heightened risk of perinatal mortality nevertheless, the perinatal mortality rate in the cohort was lower than the national average of the general obstetric population in the country. This underpins the potential benefits of introducing such protocols for effective fetal surveillance, prompt risk stratification, and prompt obstetric interventions when indicated. The monitoring of pregnancies complicated by FGR and hypertensive disorders through serial ultrasonography and fetal Doppler velocimetry enabled appropriate clinical decision-making, including provider-initiated preterm delivery, which likely contributed to improved neonatal survival. However, the high rates of preterm deliveries and Caesarean section depict the complexity of managing such high-risk pregnancies. To further consolidate on the potential benefits of the findings of this study, there is an urgent need to address systemic barriers including late antenatal booking, limited access to specialist care, and shortages of trained personnel. Integrating structured antenatal surveillance into routine obstetric care, alongside broader health system strengthening, may provide a pragmatic pathway toward reducing stillbirths and perinatal mortality in Nigeria and similar low-resource settings.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee Obafemi Awolowo University Teaching Hospitals Complex (ERC/2020/07/08).

REFERENCES

1. United Nations Children's Fund. Stillbirth. New York: United Nations; 2025. Available at: https://data.unicef.org/topic/child-survival/stillbirths/#:~:text=Women%20in%20sub%2DSaharan%20Africa,stillbirths%20per%201%2C000%20total%20births. Accessed on 25 March 2026.
2. United Nations Children Fund. Global, regional, and national estimates and trends in stillbirths from 2000 to 2019: A systematic assessment. New York: UNICEF; 2021. Available at: https://data.unicef.org/resources/global-regional-and-national-estimates-and-trends-in-stillbirths/#:~:text=Stillbirths%20are%20a%20major%20public,the%20under%2Dfive%20mortality%20rate. Accessed on 25 March 2026.
3. Moyer CA, Dako-Gyeke P, Adanu RM. Facility-based delivery and maternal and early neonatal mortality in sub-Saharan Africa: a regional review of the literature. Afr J Reprod Health. 2013;17(3):30-43.
4. National Population Commission (NPC) [Nigeria], ICF. Nigeria Demographic and Health Survey 2024. Abuja and Rockville: NPC and ICF. 2024.
5. Tukur J, Lavin T, Adanikin A, Abdussalam M, Bankole K, Ekott MI, et al. Quality and outcomes of maternal and perinatal care for 76,563 pregnancies reported in a nationwide network of Nigerian referral-level hospitals. eClin Med. 2022;47:101411.
6. United Nations Children's Fund, World Health Organization, World Bank Group. A neglected tragedy. The global burden of stillbirth. Geneva: WHO. 2020. Available at: https://www.unicef.org/reports/neglected-tragedy-global-burden-of-stillbirths-2020. Accessed on 1 March 2026.
7. Lamont K, Scott NW, Jones GT, Bhattacharya S. Risk of recurrent stillbirth: systematic review and meta-analysis. BMJ. 2015;350(3):h3080.
8. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, et al. High-quality health systems in the Sustainable Development Goals era: time for a revolution. Lancet Glob Health. 2018;6(11):e1196-252.
9. Flenady V, Koopmans L, Middleton P, Frøen JF, Smith GC, Gibbons K, et al. Major risk factors for stillbirth in high-income countries: a systematic review and meta-analysis. The Lancet. 2011;377(9774):1331-40.

10. Royal College of Obstetricians and Gynaecologists (RCOG). Investigation and management of the small-for-gestational-age fetus (Green-top Guideline No. 31). London: RCOG. 2014.
11. Rolnik DL, Wright D, Poon LC, O'Gorman N, Syngelaki A, De Paco Matallana C, et al. Aspirin versus Placebo in Pregnancies at High Risk for Preterm Preeclampsia. N Engl J Med. 2017;377(7):613-22.
12. Chudleigh T, Cohen-Overbeek TE, for the ISUOG Basic Training Sub-Committee. How to apply the 20 + 2-planes method for identification of 65 fetal abnormalities during routine second-trimester fetal ultrasound examination. Ultrasound Obstet Gynecol. 2025;66(3):383-96.
13. American College of Obstetricians and Gynecologists. Antepartum fetal surveillance. ACOG Practice Bulletin No. 229. Obstet Gynecol. 2021;137(6):e177-97.
14. Goldenberg RL, Saleem S, Pasha O, Harrison MS, Mcclure EM. Reducing stillbirths in low-income countries. Acta Obstet Gynecol Scand. 2016;95(2):135-43.
15. Kuti O, Awowole I, Okunola T. Audit of stillbirths in a Nigerian teaching hospital. Trop J Obstet Gynaecol. 2017;34(3):188.
16. Alfirevic Z, Stampalija T, Dowswell T. Fetal and umbilical Doppler ultrasound in high-risk pregnancies. Cochrane Pregnancy and Childbirth Group, editor. Cochrane Database Syst Rev. 2017;2017:6.
17. United Nations. Transforming our World; The 2030 Agenda for Sustainable Development. New York: UN. 2015. Available at: https://sdgs.un.org/2030agenda. Accessed on 1 March 2026.

Cite this article as: Awowole IO, Anyabolu HC, Adeniyi OA, Bola-Oyebamiji SB, Omitinde OS. Impact of intensive antenatal monitoring on perinatal outcomes among women with previous perinatal deaths in Nigeria: a prospective cohort study. Int J Reprod Contracept Obstet Gynecol 2026;15:xxx-xx.